## AGRICULTURAL WASTE MANAGEMENT SYSTEMS

This appendix contains the capacity curves for use in the design of debris basins and the yardage tables to be used for field layout and pay quantity computations.

Users are cautioned that the design height used on the capacity curves is not the same as the height given in the yardage tables. Debris basins will be constructed with 0.4' freeboard; therefore, a basin with a design height of 3.0 ft. will have a constructed height of 3.4 ft.

**Example:**

Given lot 800 x 300 with 800 ft. dimension parallel to the contour.

Land Slope = 4%

10-yr, 24-hr Rainfall = 4.6 in

Solids Storage = 1/2 ac. in/ac

**Solution Method 1**

Area of Lot = $\frac{(Length)\,(Width)}{43560\ sq.ft.}$

$= \frac{(800')\,(300')}{43560} = 5.5\ ac$

10-yr, 24-hr Runoff = (90%) (Rainfall) (Area)

= (.90) (4.6") (5.5 ac)

= 22.8 ac in

Solids Storage = (1/2 ac in) (area in acres)

= (1/2 ac in) (5.5 ac)

= 2.75 ac in (use 2.8 ac in)

Release Rate = $\frac{(10-yr\ 24-hr\ Runoff)}{(Desired\ Emptying\ Time)}$

$= \frac{22.8\ ac\ in}{72\ hrs} = 0.31\ Ac\ in/hr$

Volume Released During Storm

= (Release Rate) (Storm Period)

= (0.31) (24) = 7.44 ac. in.

(This release rate will be used to size the outlet pipe.)

Dead Storage Volume

= (Runoff Vol) + (Solids Vol)- (Released Vol)

= (22.8) + (2.8) - (7.4)

= 18.2 ac in

This is the volume of storage that must be provided for in the Debris Basin(s).

<u>The curves for land slopes of 4% or less include the volume of runoff stored outside the constructed channel.</u>

Assume that the Basins will drain from both ends to the center; therefore, use two Basins 400' long with a maximum depth of 3 feet and the drain in the middle rather than a single Basin 800 feet long with a maximum depth of 3 feet. Storage required per 400'

Basin = $\frac{(Total\ Basin\ Storage)}{2}$

$= \frac{18.2}{2}$ ac in = 9.1 ac in

Land slope = 4%; therefore, use the family of capacity curves for 4% land slopes with varying basin grade and bottom widths.

Beginning with the capacity curve for a 4% land slope and a basin grade of .001 ft/ft and reading up the line at 400 ft. of length, we find that a 10'-wide basin provides 6.5 ac. in.; a 20'-wide basin provides 9.6 ac. in.

The same process is then repeated using the capacity curves for a 4% land slope and a Basin grade of .002 ft/ft, and we find that the required storage falls between the 20' and 30' bottom width curves.

<u>The rated capacity of a basin may be exceeded by 10%, as this will impinge on the freeboard 0.1 ft or less.</u> Therefore, if we take the capacity of the 20' wide basin 400-ft long of 8.7 ac in and add 0.8 ac in the sum equals 9.5 ac in which exceeds the requirement.

Since a steeper basin grade will provide us a better draining basin, we will choose the 20' bottom width basin with a grade of .002 ft/ft assuming the topography and lot layout will accommodate it.

When the appropriate channel size and grade has been calculated, the yardage and layout dimensions may be determined by using the appropriate Debris Basin yardage table. (<u>Note: For a maximum designed height of 3', you must use a maximum constructed height of 3.4' to provide the required freeboard.</u>) Using the table for a land slope of 4% and a channel bottom width of 20', the maximum constructed height of 3.4 ft. and all pertinent dimensions and volumes will be found on the first line. This will be Sta 0+00.

The constructed height at any station upchannel may be computed by the following equation:

> Constructed Height at Upchannel Station equals construction height minus (Channel slope in. ft/ft.) times (distance upchannel from the maximum construction height station)

> Constructed Height at Sta 1 + 00
>
> = 3.4' -(.002 ft/ft) (100 ft)
>
> = 3.4' - 0.2' = 3.2 ft

The applicable dimensions and volumes for this constructed height are found on the second line of the same table. This process will be repeated for each station you wish to stake in the field.

**Layout in the field will be as follows**:

- **Locate and stake to grade, the Debris Basin Outlet**: This elevation will be the same as the elevation of the bottom of the basin and must be located so the cut is equal to CI as shown on the table at the stake line. (See sketch 1)
- **Compute Grade Rods**: For each 100-ft. sta (50 ft. Stations may be needed in some cases.)
- **Set Stake Line to Grade**: To determine location of the stake line for case one, subtract the cut shown for the proper fill height in the appropriate table from the grade rod computed. This will give you the grade rod to be used on the ground surface at the stake line. Move up or down slope until the rod reading equals the grade rod and set stake line flag. This stake will be located at the 0 cut 0 fill point on the upslope side of the Debris Basin Dike. To determine the location of the stake line for case two, merely compute the grade rod and locate that point on the ground. This stake will be located at the upslope toe of the dike.
- **Set Slope Stakes**: Measure downslope a distance equal to DI and set flag for downstream toe of dike. Measure upslope a distance equal to D2 and set flag for beginning of uphill cut. After the basin has been staked, some adjustment in alignment may be desirable to avoid sharp curves. This

may be done to a limited extent, without substantially affecting the yardage.

- **Compute Pay Quantities**: Quantity of earth moved may be computed as follows:

From the Debris Basin Yardage table

Max Const Height at Sta 0+00 = 3.4 ft.

Excavation for H of 3.4 = 1.64 cu yd/ft

Constructed Height at Sta 1+00 = 3.2

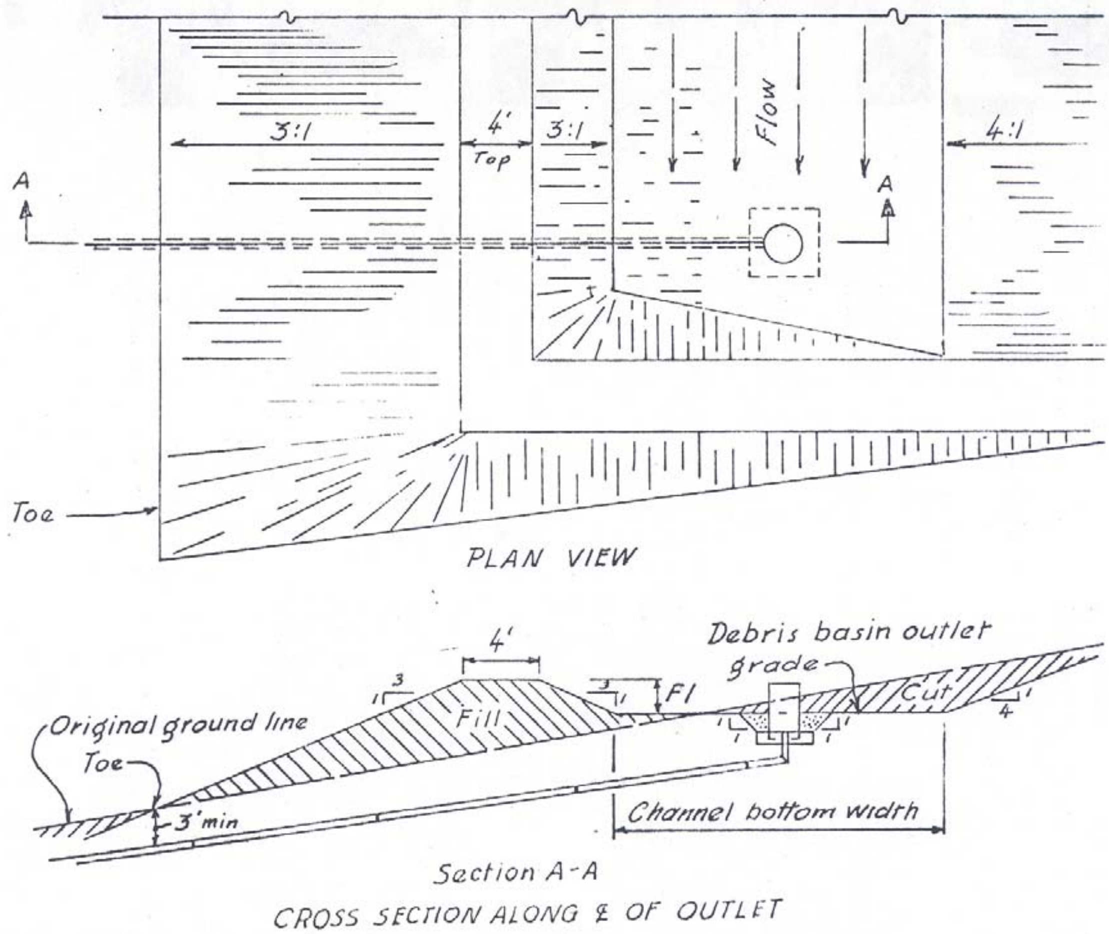
Excavation for H of 3.2 = 1.38 yd/ft

Excavation = (Exc at 0+00) + (Exc at 1+00) x Distance

$$= \frac{(1.64\ cu\ yd/ft) + (1.38\ cu\ yd/ft)}{2} x\,100$$

= 151 cu yds/100 ft

ENG-24




DEBRIS BASIN OUTLET

SKETCH #1

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

| COMPILED | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|
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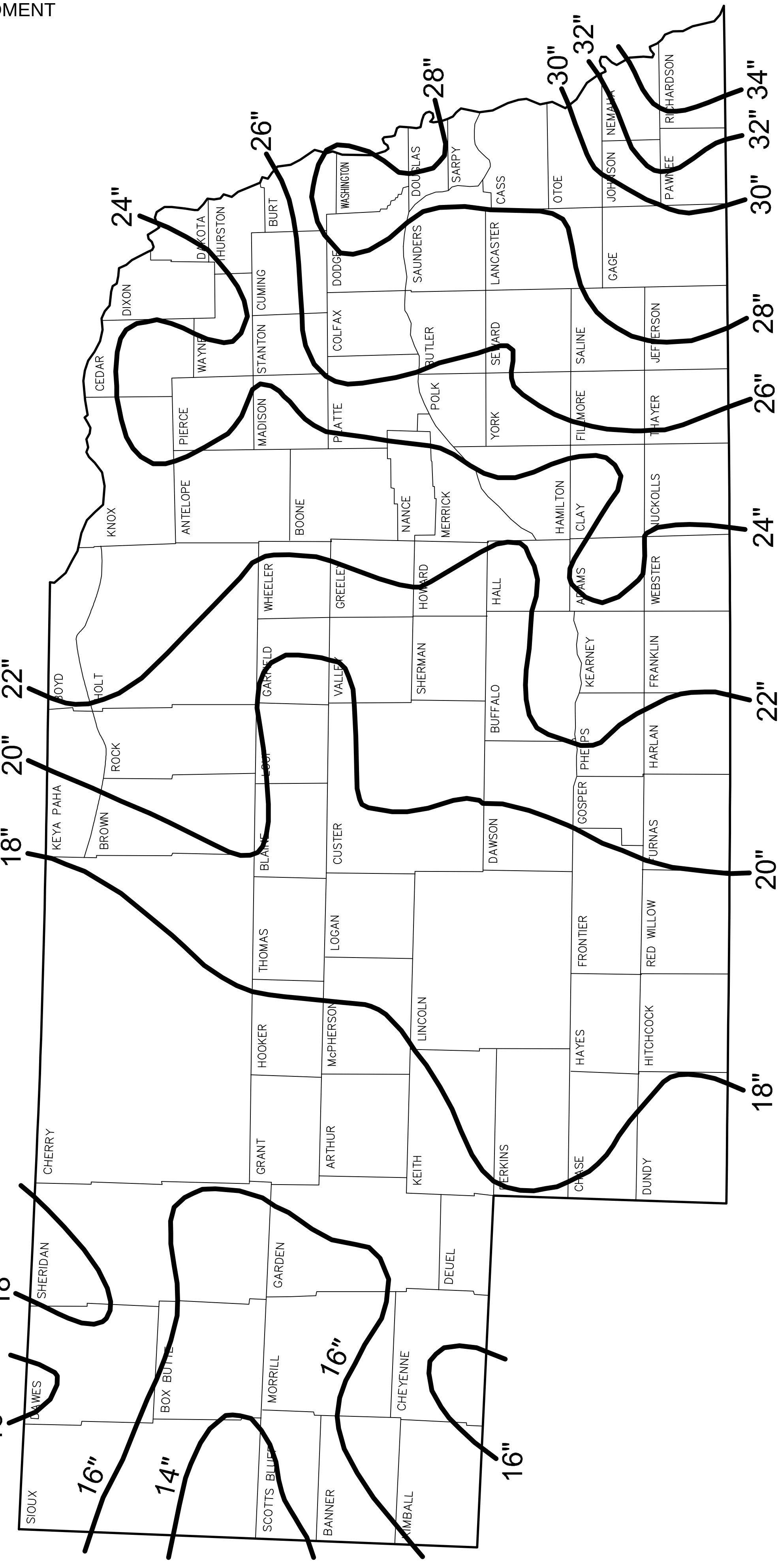
# Appendix II




NEBRASKA - MEAN PRECIPITATION

U.S. Weather Bureau Normal Annual Precipitation, 30-Year Period (1931-1960)

USDA–Natural Resources Conservation Service